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The following particulars afforded by the orbit may be noted. The greater maximum distance was $2''\cdot 58$ nearly, for position equal to 41°, and for epoch 1832: the annual angular motion was then about $1^\circ\cdot 5$. The smaller maximum distance was $1''\cdot 48$, for position equal to 244° nearly, and epoch about 1878·5. The greater minimum distance was $1''\cdot 33$ approximately, for position equal to 297°, and epoch about 1868. The smaller minimum distance will be $1''\cdot 05$ nearly, for position equal to 154°, and epoch about 1892·8: the annual angular motion will then be nearly 9°. Thus the greatest annual angular motion will be about six times the least.

Streatham Hill.

A Simple Method of obtaining an Approximate Solution of Kepler's Equation. By Arthur A. Rambaut, M.A.

(*Communicated by Sir R. S. Ball, LL.D., F.R.S.*)

From time to time a good many suggestions have been made for obtaining approximate solutions of the equation

$$u - e \sin u = nt\,;$$

but, although some of these are very useful when required in the case of one particular orbit, I know of no method, at once so simple and so easily applied to a number of orbits, as the following, which occurred to me when calculating the true anomalies for the binaries, given in Table II. of the following communication.

It depends on the principle that the abscissa of a prolate trochoid, generated by the rolling of a circle along a line parallel to the axis of x, is given by the equation

$$x = a\theta - d \sin \theta.$$

The construction will at once be seen from a description of the apparatus I made for myself, and by the aid of which I was able to obtain u for any orbit, to a quarter of a degree or so in about half a minute.

This degree of precision was, of course, quite sufficient for my purpose, but in various researches connected with double stars, such, for instance, as the comparison of the elements with the data or the construction of an ephemeris, a solution of this kind would, I think, furnish a very good first approximation.

In the figure, MN represents the edge of a straight ruler, glued to a sheet of millimetre paper, about 500^{mm} long and 250^{mm} broad, and which coincides with one of the lines on the paper. PQ is a line drawn at right angles to the ruler, at a distance of about 130^{mm} from the left edge of the paper. At a distance of 102^{mm} from the ruler is a line ROS parallel to it, and graduated to the right and left of PQ in degrees, on the scale of $314^{\mathrm{mm}}\cdot 159$ to 180°. ABD and A′B′D′ represent two

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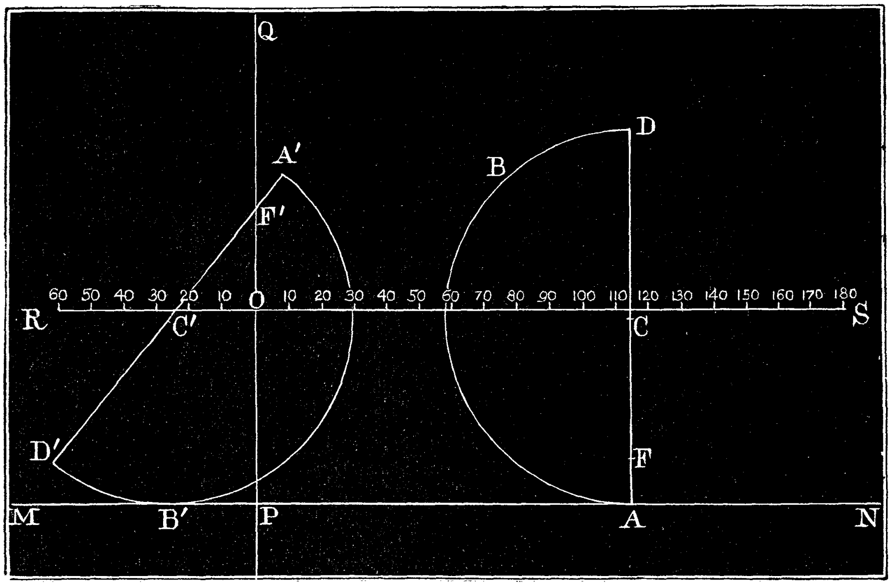
positions of a piece of stout cardboard, carefully cut in the form of a semicircle of 200$^{\text{mm}}$ diameter, the radius CA being



Kepler's Equation.

graduated in millimetres. A point F is taken on CA, so that $\frac{\text{CF}}{\text{CA}} = e$.

To use the apparatus, all that is necessary is to set AD at right angles to RS (which is easily done by the lines on the paper) at a distance from PQ equal to the mean anomaly (nt), and to roll the semicircular card along the ruler until the point F lies on the line PQ. Then the distance OC′ is equal to $u - nt$.

It only remains, therefore, to add OC′, which is obtained in degrees directly from the scale RS, to nt in order to obtain u in degrees.

In the example illustrated in the figure, I have taken nt equal to twice the angular unit $= 114^\circ{\cdot}6$ and $e = 0{\cdot}75$. By rolling the card I find

$$\text{OC}' = 26^\circ{\cdot}8\,;$$

whence

$$u = 114^\circ{\cdot}6 + 26^\circ{\cdot}8 = 141^\circ{\cdot}4.$$

On the Parallax of Double Stars. By Arthur A. Rambaut, M.A.

(*Communicated by Sir R. S. Ball, LL.D., F.R.S.*)

In a paper published in the *Proceedings of the Royal Irish Academy* (2nd ser., vol. iv., No. 6), I pointed out the relation connecting the parallax and the relative velocity of the compo-

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